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IS 12286 (1988): Method for determination of abrasive wear resistance of hardmetals [MTD 25: Powder Metallurgical Materials and Products]

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Indian Standard

METHOD FOR DETERMINATION OF ABRASIVE WEAR RESISTANCE OF HARDMETALS

Powder Metallurgical Materials and Products Sectional Committee, SMDC 30 [Ref : Doc : SMDC 30 (3093)]

1. Scope — This standard covers the method for determination of abrasive wear resistance of hardmetals.

2. Definitions

2.1 *Abrasive Wear* — Wear caused by a slurried abrasive on a rotating surface, contacting the specimen surface under pressure.

2.2 *Abrasive Resistance* — The unit loss in volume of the specimen per revolution of steel wheel carrying the abrasive.

2.3 *Wear Number* — The reciprocal of the total loss in volume of the speciman in units of cm^{-3}.

3. Apparatus

3.1 *Vessel* — Suitable for holding the abrasive slurry and the wheel (*see* Fig. 1) and shall be made of 5 mm thick steel. The internal dimensions shall be :

a) Height = 220 mm
b) Length = 245 mm
c) Width = 60 mm
d) Radius of the bottom = 40 mm

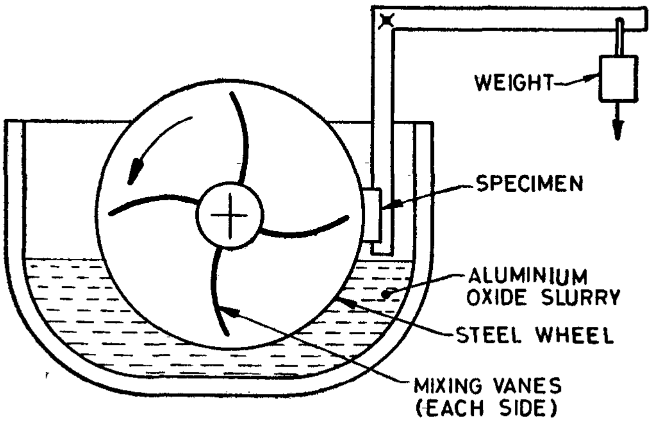

FIG. 1 SCHEMATIC DIAGRAM OF ABRASIVE WEAR RESISTANCE APPARATUS

3.2 *Wheel* — Made of annealed mild steel (Designation 20C8) and shall rotate in the centre of the vessel at 100±5 rpm. The direction of rotation shall be from the slurry to the specimen. Four curved vanes shall be affixed to either side of the wheel to agitate and mix the slurry and to propel it towards the specimen. The maximum wheel diameter shall be 170 mm and the width shall be 12·7±0·1 mm. The wheel shall be discarded when its diameter has decreased to 165 mm, *Min.* after repetitive use. In use, a slight burr will form at the periphery. This burr will compensate for wheel wear by widening the wear path in the specimen, it shall not be removed.

3.3 *Specimen Holder* — To be pressed against the periphery of the wheel. This specimen holder shall be mounted so that not more than 0·05 mm of side play occurs at the line of contact between the specimen and the wheel. The specimen is tangential to the wheel at the centre line of the wheel and the specimen. A 10 kg weight shall be attached to the other end of the specimen holder lever arm. With a lever advantage of two-to-one, a force of 20 kg is thus applied to the specimen at the line of contact.

Adopted 25 February 1988

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4. Test Specimen — The specimen shall be at least 5 mm thick and have a surface area large enough so that the wear will be confined within its edges. The specimen may be as large as the specimen holder of the apparatus permits. Dimensional tolerances are notimportant but the specimen shall be flat within a maximum of 0·004 mm/mm. Surface finish of the specimen is not important except that ground blanks shall be cleaned with a suitable solvent to removeall oils or waxes, and unground blanks shall be grit blasted to remove all adhering foreign particles.

5. Procedure

5.1 Weigh the specimen on an analytical balance to the nearest 0·001 g.

5.2 Determine the density.

5.3 Place the specimen in a specimen holder and fasten rigidly with set screws and pressure plates.

5.4 Insert the specimen holder into the abrasion wear test machine.

5.5 Release the 10 kg weight, causing the load to be applied to the specimen that is bearing against the wheel.

5.6 Plug the drain at the bottom of the vessel.

5.7 Pour aluminium oxide grit, 30 mesh, into the vessel to within 25 mm of the centre of the wheel. If a different abrasive is used, it should be noted in the report. Add water to the aluminium oxide in the proportion of 1 ml/4g of grit.

5.8 Just when the water has seeped into the abrasion grit, start the rotation of the wheel and continue for 1 000 revolutions (determined by means of a revolution counter). If the abrasive tends to accumulate at the end of the vessel opposite the specimen, stir and agitate with a rod to ensure that it is mixed into the slurry. Constantly check the wheel during the run to ensure that a thin film of abrasive slurry is evenly dispersed over the outside rim which is not in contact with the slurry.

5.9 Stop the rotation of the wheel after 1 000 revolutions. Remove the drain block and flush the slurry out of the vessel. Do not re-use the abrasive grain; use fresh grain for every run.

5.10 Remove the sample from the specimen holder, rinse free of grit, and dry.

5.11 Weigh the specimen again to the nearest 0·000 1 g.

6. Calculations — Calculate the abrasive resistance, A, in cubic centimetres per revolution, as follows:

$$A = \frac{m}{1\,000\,\rho} \times 10^5$$

where

m = mass loss, g, and
ρ = specimen density, g/cm^3

6.1 Calculate the wear number, W, in reciprocal cubic centimetres, as follows:

$$W = \frac{\rho}{m}$$

7. Test Report — The name of manufacturer, grade designation of specimen and the abrasion resistance or wear number shall be included in the report.

EXPLANATORY NOTE

In the preparation of this standard, assistance has been derived from ASTM B 611-76 'Abrasive wear resistance of cemented carbide', issued by the American Society of Testing and Materials, USA.

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